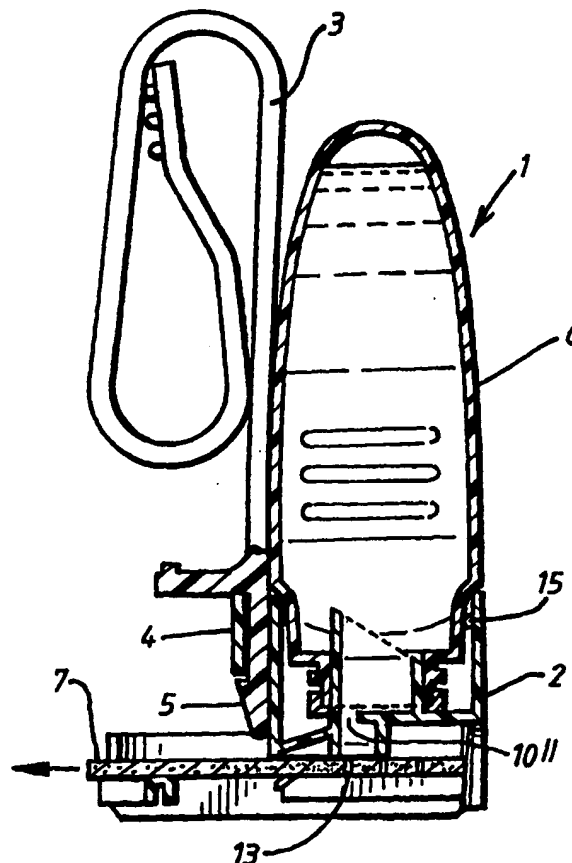


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**(54) Title:** LIQUID DISPENSER**(57) Abstract**

A liquid dispenser (1) comprises a housing (2) and a hook (3) for suspending the housing (2) from the rim of a lavatory bowl. A user inserts a sealed inverted reservoir bottle (6) into the housing (2), which breaks the seal. A porous pad (7) located in the housing (2) conveys liquid from the bottle (6) to a position within the stream of flushing water. The pad (7) can be adjusted to accommodate different lavatories and has two guide slots which are engaged by two fingers in the housing which define two extreme positions of the pad (7). To allow venting of the bottle (6), small vent holes (14) are formed in the pad (7). The pad may alternatively be a solid plate of the same shape but having a number of raised holes or elongate slots. The plate may have a venting post which mates with the mouth of the bottle (6). Venting may be achieved by providing an aperture in the bottle. The top of the bottle may be provided with: a one-way valve; with a plug which seals the aperture, the housing having a pin which bears on the plug and releases it into the bottle; a breakable seal which covers the aperture, the housing being provided with a tube member which seals the aperture; or a removable tab which covers the aperture and which is broken away from the bottle prior to insertion, either by the user or, automatically, by a projection within the housing.



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## DISPENSING LIQUIDS

The present invention relates to liquid dispensers and in particular to arrangements for dispensing quantities of liquids, such as cleaning and/or refreshing liquids, from the rim  
5 of a lavatory bowl. Such dispensers typically comprise a reservoir in the form of an inverted bottle, which supplies the liquid to a wicking device, such as a porous pad.

One known device of this type is described in published European patent application EP-A-0 785 315. This application acknowledges the problem with such devices that as  
10 the liquid level in the bottle falls the rate at which liquid is dispensed falls with time and thereby renders the dispenser less effective.

The solution to this problem suggested by the above reference is to provide a structure between the mouth of the bottle and the wicking device so as to permit both the flow of  
15 the liquid from the bottle to the wicking device and also a return flow of air from outside the dispenser to the bottle.

However, the proposed structure is complex and therefore expensive to manufacture. Furthermore, a given dispenser of the type described in this reference can function only  
20 with a lavatory system having a predefined relative position of the rim of the lavatory bowl and the stream of flushing water.

A further problem with prior-art liquid dispensers of this type is that, when the consumer causes the bottle to be opened, e.g. by inserting the inverted bottle in a  
25 dispensing unit, some of the liquid spurts out as a result of the liquid in the bottle being slightly above atmospheric pressure, possibly because the act of sealing the mouth of the bottle in the factory pressurises the liquid to some extent.

It would therefore be desirable to provide liquid dispensers and methods of filling  
30 bottles for such dispensers which overcome, or at least mitigate, one or more of the above disadvantages of the prior-art dispenser.

In accordance with a first aspect of the present invention there is provided a liquid dispensing unit comprising a housing containing a wicking device for conveying liquid to be dispensed from a reservoir to a dispensing position, wherein the unit is so structured as to permit the position of the wicking device to be adjusted between  
5 different positions so as to function in different environments.

In accordance with a second aspect of the present invention there is provided a dispensing unit for dispensing a liquid from the rim of a lavatory bowl, the unit comprising a housing containing a wicking device for conveying liquid to be dispensed  
10 from a reservoir to a position within the stream of flushing water, wherein the unit is so structured as to permit the position of the wicking device to be adjusted between different positions so as to function with lavatory bowls with different shapes and different flushing systems.

15 The wicking device is preferably provided with at least one venting aperture, which when the device is adjustable, are positioned such that there is at least one functioning venting hole for every possible functional position of the adjustable wicking device.

A spillage tray is advantageously positioned in use below the wicking device having  
20 formed therein a vent channel arranged in communication with the at least one functioning venting aperture.

In accordance with a third aspect of the present invention there is provided a liquid dispensing unit comprising a housing containing a wicking device for conveying liquid  
25 to be dispensed from a reservoir to a dispensing position, wherein the wicking device is provided with at least one venting aperture which in use communicates between ambient air and the reservoir so as to enable air to displace liquid dispensed from the reservoir.

30 In accordance with a fourth aspect of the present invention there is provided a dispensing unit for dispensing a liquid from the rim of a lavatory bowl, the unit comprising a housing containing a wicking device for conveying liquid to be dispensed from a reservoir to a position within the stream of flushing water, wherein the wicking

device is provided with at least one venting aperture which in use communicates between ambient air and the reservoir so as to enable air to displace liquid dispensed from the reservoir.

- 5 The or each venting aperture may be in the form of a substantially circular hole or an elongate slit.

The unit is preferably so structured as to permit the position of the wicking device to be adjusted between different positions so as to function with lavatory bowls with different  
10 shapes and different flushing systems.

The dispensing unit preferably further comprises a conduit for conveying liquid from the reservoir to the wicking device. The conduit may comprise a cylindrical inlet portion of substantially circular cross-section for engaging the circular mouth of a bottle  
15 constituting the reservoir and preferably terminates obliquely so as to define a substantially elliptical aperture. The conduit may further comprise a substantially cylindrical outlet portion, e.g. of a D-shaped, circular or substantially rectangular cross-section, having a cross-sectional area substantially less than that of the inlet portion, and the inlet portion of the conduit may be laterally displaced from the outlet portion. Such  
20 an arrangement is geometrically particularly advantageous when an adjustable wicking device is provided. When the outlet portion has a D-shaped cross-section, the bar of the "D" can be arranged to coincide with a diameter of the substantially circular inlet portion of the conduit when viewed vertically. The outlet portion of the conduit bears against the wicking device so as to create a substantially liquid-tight seal therebetween.

25

The outlet portion is preferably at least partially surrounded by a barrier wall, which may be cylindrical and of rectangular cross-section. This serves to prevent ingress of flushing water into the reservoir.

- 30 The wicking device preferably comprises a first portion for receiving liquid from the reservoir and a second portion arranged to be positioned in use in a dispensing position. The second portion may be arranged to be positioned in use within the stream of

flushing water, in which case the second portion is preferably arranged to be positioned in use between the first portion and the rim of the lavatory bowl.

The dispensing unit is preferably structured such that the position of the wicking device  
5 can be adjusted by sliding the first portion thereof against the outlet portion of the conduit.

The wicking device is preferably substantially laminar and may be formed with a depression for receiving the neck of a bottle constituting a said reservoir. The wicking  
10 device may be formed with one or more elongate apertures and the housing may comprise a corresponding one or more projections for engaging the elongate apertures so as to define the outermost possible operative position of the wicking device. In this case, the or each projection may comprises a spring finger which is arranged to engage its corresponding aperture in the wicking device when the wicking device is inserted  
15 into the housing.

The wicking device may comprise a projection for insertion in the mouth of a said reservoir in use, the projection having formed therethrough a vent channel.

20 The wicking device preferably comprises a porous pad but may alternatively comprise a plate with capillary channels or circular holes formed therein. The capillary channels may be formed as elongate apertures or elongate channels within the plate.

The invention extends to the combination of such a dispensing unit and means for  
25 suspending the unit from the rim of a lavatory bowl.

The invention extends to the combination of such a dispensing unit, which is provided with a conduit having an inlet portion of substantially circular cross-section, and a bottle constituting the reservoir, the bottle comprising an opening for dispensing the liquid  
30 therefrom, the opening having a substantially circular cross-section greater than that of the inlet portion of the conduit.

The mouth of the bottle is covered prior to use with a frangible seal which is arranged to be broken in use by compressing the seal against the circular inlet portion of the conduit. Such an arrangement is particularly convenient for the user.

- 5 The invention extends to the combination of such a dispensing unit and bottle and means for suspending the unit and the bottle from the rim of a lavatory bowl.

In accordance with a fifth aspect of the present invention there is provided a liquid dispensing unit comprising a wicking device for conveying liquid to be dispensed from  
10 a reservoir to a dispensing position, in combination with a reservoir bottle, wherein the reservoir bottle is provided with venting means for permitting ambient air to enter the bottle to displace liquid dispensed therefrom.

In accordance with a sixth aspect of the present invention there is provided a dispensing  
15 unit for dispensing a liquid from the rim of a lavatory bowl, in combination with a reservoir bottle, the unit comprising a wicking device for conveying liquid to be dispensed from the reservoir bottle to a position within the stream of flushing water, wherein the reservoir bottle is provided with venting means for permitting ambient air to enter the bottle to displace liquid dispensed therefrom.

20

The venting means may comprise a one-way valve, such as a duck-bill valve.

Alternatively, the venting means may comprise a removable plug, and said unit may comprise a co-operating projection which is positioned so as to remove the plug when  
25 the reservoir bottle is placed by a user in its operative position in relation to the unit, thereby to create a venting aperture in the reservoir bottle.

In a further arrangement, the venting means may comprise a removable seal, and said unit may comprise a co-operating hollow projection which is positioned so as to remove  
30 the seal and project into the reservoir bottle when the reservoir bottle is placed by a user in its operative position in relation to the unit, the hollow projection constituting a venting channel.

In a yet further arrangement, the venting means may comprise an air vent in the reservoir bottle which is sealed by a cover portion which either can be removed by a user prior to use or is automatically removed by a projection arranged on the unit so as to remove the cover portion when the reservoir bottle is placed by a user in its operative position in relation to the unit.

The invention extends to a method of filling and sealing a dispenser bottle for use as a reservoir within such a dispensing unit, the method comprising heating the liquid prior to sealing the reservoir bottle so as to create a partial vacuum within the bottle when the liquid cools to room temperature. Alternatively, or in addition thereto, the bottle may be compressed after filling the bottle with the liquid, and the bottle sealed while compressed so as to create a partial vacuum within the bottle after sealing.

Preferred embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a liquid dispenser in accordance with a preferred embodiment of the present invention;

Figure 2 is a cross-sectional view of the embodiment shown in Figure 1;

Figure 3 is a detail of the cross-sectional view of Figure 2 in a different configuration and without the reservoir bottle;

Figure 4 is a plan view of the embodiment shown in Figures 1 to 3 but without the reservoir bottle;

Figures 4 (a) to 4 (c) illustrate plan views from underneath of three different structures of the outlet portion;

Figure 5 is a front view of the liquid dispenser of Figures 1 to 4;

Figure 6 is a rear view of the liquid dispenser of Figure 1 to 5;



Figure 7 illustrates schematically the manner in which a porous pad may be inserted into the housing of a liquid dispenser of the preferred embodiment;

5        Figure 8 illustrates schematically the relative position of the dispensing device of the preferred embodiment and a lavatory rim from which the device is suspended;

Figure 9 illustrates schematically the relative position of the dispensing device of the preferred embodiment in another configuration and a different lavatory rim from  
10        which the device is suspended;

Figure 10 is a chart illustrating different types of lavatory flushing arrangements;

Figure 11 illustrates an optional arrangement of a spillage tray and vent channel  
15        for use with the preferred embodiment;

Figure 12(a) illustrates a first alternative structure for the wicking device of the liquid dispenser shown in Figures 1 to 10;

20        Figure 12(b) is a cross-sectional view of the wicking device shown in Figure 12(a);

Figure 13(a) illustrates a second alternative structure for the wicking device of the liquid dispenser shown in Figures 1 to 10;

25

Figure 13(b) is a cross-sectional view of the wicking device shown in Figure 13(a);

Figure 14 illustrates a third alternative structure for the wicking device of the  
30        liquid dispenser shown in Figures 1 to 10;

Figure 15(a) is a perspective view of a fourth alternative structure for the wicking device in combination with the reservoir bottle of the liquid dispenser shown in Figures 1 to 10;

5        Figure 15(b) is a cross-sectional view of the wicking device and reservoir bottle shown in Figure 15(a);

Figure 16(a) is a perspective view of a first alternative venting arrangement for the liquid dispenser shown in Figures 1 to 10;

10

Figure 16(b) is a cross-sectional view of the venting arrangement shown in Figure 16(a);

Figure 17(a) is a perspective view of a second alternative venting arrangement  
15 for the liquid dispenser shown in Figures 1 to 10;

Figure 17(b) is a cross-sectional view of the venting arrangement shown in Figure 16(b);

20        Figure 17(c) is a portion of the cross-sectional view of Figure 17(b) illustrating the release of the venting plug;

Figure 18(a) is a perspective view of a third alternative venting arrangement for the liquid dispenser shown in Figures 1 to 10;

25

Figure 18(b) is a cross-sectional view of the venting arrangement shown in Figure 18(a);

Figure 18(c) is a portion of the cross-sectional view of Figure 18(b) illustrating  
30 the breaking of the venting seal;

Figure 19(a) is a perspective view of the top of the reservoir bottle and the housing in a fourth alternative venting arrangement for the liquid dispenser shown in Figures 1 to 10;

5        Figure 19(b) is a cross-sectional view of the venting arrangement shown in Figure 19(a) after insertion of the reservoir bottle in the housing;

Figure 20(a) is perspective view of a fifth venting arrangement for the liquid dispenser shown in Figures 1 to 10;

10

Figure 20(b) is a perspective view of a portion of the reservoir bottle shown in Figure 20(a) showing the cover plate broken away to expose the vent hole; and

Figure 20(c) is a cross-sectional view of a sixth venting arrangement, similar to  
15        that shown in Figures 20(a) and 20(b) but wherein the cover plate is broken away automatically by a projection on the housing of the liquid dispenser on insertion of the reservoir bottle into the housing.

With reference to Figures 1 to 7, a liquid dispenser 1 comprises a housing 2 and a  
20        sprung suspension hook 3 for suspending the housing 2 from the rim of a lavatory bowl (not shown). For ease of manufacture, the suspension hook 3 is formed as a separate component from the housing 2, and the housing 2 is formed with an integral guide channel 4 (see Figure 2) of rectangular cross-section into which the lower end of the suspension hook 3 is inserted during manufacture. The lower end of the suspension  
25        hook 3 comprises a raised, chamfered portion 5, such that, upon insertion, the hook 3 remains engaged within the channel 4 by a snap-fitting arrangement.

Once the unit is thus suspended, a user inserts in the housing 2 a sealed inverted reservoir bottle 6 into the housing 2. The act of insertion causes the seal on the  
30        reservoir bottle 6 to break, in a manner to be described below. A wicking device in the form of a porous pad 7 is located in a slot within the housing 2, and this pad conveys liquid from the reservoir bottle 6 to a position within the stream of flushing water within the lavatory by capillary action.

The housing includes a conduit 8 for conveying the liquid from the reservoir bottle 6 to the porous pad 7. The conduit 8 comprises an inlet portion 9 of circular cross-section which is sized so as to fit snugly within the circular mouth of the reservoir bottle 6. The inlet portion 9 terminates obliquely, as seen clearly in Figures 2 and 3, so as to form an elliptical mouth. The reservoir bottle 6 is sealed by a plastics or foil cap (not shown), and the act of inserting the inverted reservoir bottle 6 into the housing causes the cap to break, by virtue of the shape of the inlet portion 9 of the conduit 8 so as to permit liquid from the reservoir bottle 6 to fall under gravity into the conduit 8.

10

The conduit 8 further comprises an outlet portion 10 in the form of a cylinder which bears against the porous pad 7. The cross-sectional area of the outlet portion 10 is less than that of the inlet portion 9, and this helps to prevent, or at least minimise the amount of, flushing water entering the reservoir.

15

As can be seen from Figures 4 (a) to 4 (c), the cylinder of the outlet portion 10 can be D-shaped, circular or rectangular in cross-section, and the outlet portion 10 is partially or totally surrounded by a cylindrical barrier wall 10' of rectangular cross-section, which further acts to prevent ingress of flushing water.

20

In the arrangements shown in Figures 4 (a) and 4 (b), one of the two long sides of the rectangular cross-section of the barrier wall 10' coincides with a diameter of the circular cross-section of the inlet portion 8 when viewed vertically. This arrangement enables the position of the porous pad 7 to be adjusted so as to ensure that a portion is always in the stream of the flushing water for a wide range of different lavatory bowls, whilst ensuring that the outlet portion 10 of the conduit 8 is effectively closed by the porous pad 7.

In the arrangement shown in Figure 4 (c), the centre of the rectangular cross-section of the outlet portion 10 coincides with the centre of the circular cross-section of the inlet portion 9 when viewed vertically. This arrangement is particularly suitable for use in conjunction with the embodiments of the wicking device described below with

30

reference to Figures 13 (a) and 13 (b) or Figure 14 or a wicking device in the form of a plate having elongate channels therein.

In the arrangements shown in Figures 4 (a) and 4 (b), the inlet and outlet portions 9, 10  
5 of the conduit 8 are separated by a membrane provided with a small circular aperture 10".

In the arrangements shown in Figures 4 (a) and 4 (c), the D-shaped cross-section and the rectangular cross-section of the outlet portion 10' are sufficiently large to dispense a  
10 desired quantity of liquid on to the porous pad 7 between flushes.

The manner in which the position of the porous pad 7 can be adjusted by a user is illustrated in Figure 7. The porous pad 7 is provided with two elongate guide slots 11 which are engaged by two corresponding spring fingers 12 in the housing 2. The guide  
15 slots 11 serve to define the two extreme positions of the range of possible positions of the porous pad 7 within the housing 2.

In order to allow air to replace liquid dispensed from the reservoir bottle 6, a series of small vent holes 13, typically 1.3 mm (50/1000 inch) in diameter, are formed in the  
20 porous pad 7 and arranged such that, in whatever position of the porous pad 7 within the range defined by the guide slots 11, there is always at least one vent hole 13 communicating air from beneath the porous pad 7 to the mouth of the reservoir bottle 6 via the conduit 8.

25 The housing 2 is also formed with a series of comb-shaped apertures 14 at the bottom of the front side which allow the flushing water to drain away from above the porous pad 7.

The housing 2 is additionally provided with a number of horizontal rib-like projections  
30 15 for engaging a corresponding horizontal groove (not shown) at the top of the reservoir bottle 6 so as to retain the reservoir bottle 6 in the operative position within the housing 2 once it has been inserted by a user.

The functioning of the adjustable porous pad 7 will now be described with reference to Figures 8 and 9. Figure 8 illustrates the configuration of the dispensing device 1 when used with a lavatory with an open rim. With the dispensing device 1 suspended from the rim 16 of such a lavatory, it can be seen that the stream of flushing water, indicated by the thick arrow, passes through the porous pad 7 when the porous pad 7 is in the fully-inserted position. However, when used with a lavatory of the boxed-rim configuration, as shown in Figure 9, a longer porous pad is provided. However, it can be seen that, even if this longer porous pad 7 were to remain in its fully-inserted position, the stream of flushing water emanating from the boxed rim 17 would not contact the porous pad 7, and the device would not therefore function optimally. With such a boxed-rim configuration, a longer porous pad is provided, and this is withdrawn to a fully-extended position, as shown in Figure 9, so as to expose a portion thereof to the stream of flushing water, indicated by the thick arrow, while ensuring that the outlet portion 10 of the conduit 8 is still closed by the inner portion of the porous pad 7. As described above, this is ensured by virtue of the guide slots 11 within the porous pad 7 abutting the spring fingers 12 within the housing 2.

The adjustability of the porous pad is of particular advantage when used either with open rim lavatories or with boxed rim lavatories, since there is a large range of geometries within each type, as illustrated in Figure 10, which illustrates examples of the various lavatory rim configurations for different countries, and thereby indicating the utility of being able to select the porous pad and also to adjust its position. More specifically, the drawing illustrates the distance between the position of the housing of the liquid dispenser and the stream of flushing water. The cross-hatched area indicates the limited range distances (up to 16 mm (0.625 inch)) for which prior-art liquid dispensers would be suitable, and the single-hatched area indicates the range of distances (up to 22 mm (0.875 inch)) for a single size of porous pad according to the preferred embodiment of the invention. With larger pad sizes, the distance of utility can be extended indefinitely, but in practice, the maximum distance required is about 48 mm (1.9 inches). The bars indicate the range of distances found in different countries, as follows: (a) Australia; (b) United Kingdom; (c) Malaysia; (d) South Africa; (e) France; (f) Italy; (g) Spain; (h) Japan; (i) Thailand; (j) Brazil, Argentina and Mexico; (k) Korea; (l) Philippines; (m) and (n) U.S.A. The vertical line intersecting the bars

indicates an approximate dividing line between lavatories of the open-rim construction (to the left of the line) and those of the boxed-rim construction (to the right of the line).

In an alternative arrangement, shown in Figure 11, the housing 2 is provided with a spillage tray 18 incorporating a vertical vent channel 19 positioned in register with a vent hole 13 in the porous pad 7. This serves the function of collecting any excess liquid while still enabling venting of the reservoir bottle 6.

A first alternative structure of the wicking device is shown in a perspective view in Figure 12 (a) and in a cross-sectional view in Figure 12 (b). In this embodiment, the wicking device is in the form of a plate 20 having the same over-all shape as that illustrated in Figure 7, with the elongate guide slots 11 providing adjustability of position of the plate 20 to accommodate different lavatory geometries. However, the plate 20 is not porous but solid apart from a number of raised through-holes 21 formed therein. The holes serve to permit the liquid, when diluted with the flushing water to pass through, in the direction of the clear arrow, and also permit venting of the reservoir bottle 6, as shown by the solid arrow. The holes are sufficiently small to prevent the undiluted liquid from passing through.

A second alternative structure of the wicking device is shown in a perspective view in Figure 13 (a) and in a cross-sectional view in Figure 13 (b). As with the first alternative structure described above with reference to Figures 12 (a) and (b), the wicking device is in the form of a plate 22 having the same over-all shape as that illustrated in Figure 7, with the elongate guide slots 11 providing adjustability of position of the plate 22 to accommodate different lavatory geometries. In this embodiment, the plate 22 is again non-porous but solid apart from a number of elongate slots 23 formed therein in a generally parallel but splayed configuration. The slots 23 permit the liquid, when diluted with the flushing water to pass through, in the direction of the clear arrow, and also permit venting of the reservoir bottle 6, as shown by the solid arrow. The slots 23 are sufficiently small to prevent the undiluted liquid from passing through.

A third alternative structure of the wicking device is shown in a perspective view in Figure 14. As with the second alternative structure described above with reference to

Figures 13 (a) and (b), the wicking device is in the form of a non-porous plate 24 having the same over-all shape as that illustrated in Figure 7, with the elongate guide slots 11 providing adjustability of position of the plate 24 to accommodate different lavatory geometries and having a number of elongate slots 25 formed therein. In this embodiment, the slots 25 are arranged in a parallel fashion and not splayed. Furthermore, a recess 26 is formed within the plate 24 to accommodate the top of the inverted reservoir bottle 6.

A fourth alternative structure of the wicking device is shown in a perspective view in Figure 15 (a) and in a cross-sectional view in Figure 15 (b). As with the second and third alternative structures described above with reference to Figures 13 (a) and (b) and Figure 14, the wicking device is in the form of a non-porous plate 27 having the same over-all shape as that illustrated in Figure 7 and having a number of elongate slots 28 formed therein. In this embodiment, the slots 28 are arranged generally in a parallel fashion but form a tapered geometry in the region of the mouth of the reservoir bottle 6. The plate 27 comprises a venting post 29 which mates with the mouth of the reservoir bottle 6 in use so as to provide a vent channel. The venting post 29 is provided with a number of radial fins 30 which define conduits for the liquid between the reservoir bottle 6 and the plate 27. As with Figures 12 (b) and 13 (b), the flow of liquid and the venting are indicated by the clear and solid arrows respectively. It will be appreciated that, with this embodiment, a separate plate 27 will need to be provided for each different geometry of lavatory rim.

In the preferred embodiment, and in the alternative embodiments described above, the venting has been achieved through the wicking device. However, the invention extends to arrangements wherein the venting is achieved in a more direct fashion by providing a venting aperture in the reservoir bottle itself, in addition to the mouth of the reservoir bottle through which the liquid is dispensed.

In a first alternative venting arrangement, as shown in a perspective view in Figure 16 (a) and in a cross-sectional view in Figure 16 (b), the top face of the reservoir bottle 31 is provided with a one-way valve in the form of a duck-bill valve 32. This permits air to



pass into the reservoir bottle 31 when the pressure difference between the inside of the bottle and the outside reaches a predetermined level.

In a second alternative venting arrangement, as shown in a perspective view in Figure 5 17 (a) and in cross-sectional views in Figures 17 (b) and (c), the top face of the reservoir bottle 33 is provided with a plug 34 which seals an aperture 35 within the reservoir bottle 33, and the housing 36 is provided with a corresponding pin 37 positioned such that, when a user inserts the reservoir bottle 33 into the housing 36, in the direction indicated in Figure 17 (b) by the clear arrow, the pin 37 bears on the plug 34, in the 10 direction indicated by the solid arrow in Figure 17 (c), and releases it into the reservoir bottle 33, as shown in Figure 17 (c). The pin 37 is sized in relation to the aperture 35 so as to provide a vent channel between the pin 37 and the aperture 35.

In a third alternative venting arrangement, as shown in a perspective view in Figure 18 15 (a) and in cross-sectional views in Figures 18 (b) and (c), the top face of the reservoir bottle 38 is provided with a breakable seal 39 which covers an aperture 40 within the reservoir bottle 38, and the housing 41 is provided with a corresponding tube member 42 positioned and dimensioned such that, when a user inserts the reservoir bottle 38 into the housing 41, in the direction indicated by the clear arrow in Figure 18 (b), the tube 20 member 42 bears on the seal 39, in the direction indicated by the solid arrow in Figure 18(c), releases it into the reservoir bottle 38 and seals the aperture 40, as shown in Figure 18 (c). A venting channel is thus provided along the bore of the tube member 42. The end of the tube member 42 is chamfered for ease of location within the aperture 40.

25

In a fourth alternative venting arrangement, as shown in a perspective view in Figure 19 (a) and in a cross-sectional view in Figure 19 (b), the top of the reservoir bottle 43 is provided with a venting aperture 44 distinct from, but proximate to, the mouth 45 of the reservoir bottle 43. Both the venting aperture 44 and the mouth 45 of the reservoir 30 bottle 42 are sealed prior to use with a breakable seal (not shown). The housing 46 is provided with a post 47 positioned and dimensioned such that, when a user inserts the reservoir bottle 43 into the housing 46, in the direction indicated by the clear arrow in Figure 19 (a), the post 47 breaks the seal and is inserted in the venting aperture 44 seals

the aperture 40, as shown in Figure 19 (b). A venting channel is thus provided along the bore of the post 47.

In a fifth alternative venting arrangement, as shown in perspective views in Figures 20 (a) and (b), the top of the reservoir bottle 48 is provided with a venting hole 49 covered by a removable tab 50, which is arranged to be broken away from the reservoir bottle 48 by a user, by manipulation as indicated by the clear arrows in Figure 20 (a), prior to inserting the reservoir bottle 48 in the housing 51, as shown in Figure 20 (b). In a variant of this embodiment, as shown in a cross-sectional view in Figure 20 (c), the housing 51 is provided with a ramp projection 52 which is positioned so as automatically to remove the tab 50 a user inserts the reservoir bottle 48 in the housing 51.

The invention has been described above in relation to preferred embodiments. However, many variations and modifications will be apparent to those skilled in the art, and the scope of the invention is defined solely by the claims appended hereto.

For example, although the wicking device in the preferred embodiments has been described as comprising a porous pad or a plate having circular or elongate apertures therethrough, the wicking device could alternatively comprise a plate having elongate channels therein, and the liquid would be dispensed from these channels by virtue of the flushing water displacing the liquid from the channels.

In addition, although the preferred embodiments concern arrangements for dispensing liquid from the rim of a lavatory, the invention could also be applied to arrangements for releasing an insecticide or an air freshener into the atmosphere.

**CLAIMS:**

1. A liquid dispensing unit comprising a housing containing a wicking device for conveying liquid to be dispensed from a reservoir to a dispensing position,  
5 wherein the unit is so structured as to permit the position of the wicking device to be adjusted between different positions so as to function in different environments.
2. A dispensing unit for dispensing a liquid from the rim of a lavatory bowl, the  
10 unit comprising a housing containing a wicking device for conveying liquid to be dispensed from a reservoir to a position within the stream of flushing water, wherein the unit is so structured as to permit the position of the wicking device to be adjusted between different positions so as to function with lavatory bowls with different shapes and different flushing systems.
- 15 3. A dispensing unit as claimed in Claim 1 or Claim 2, wherein the wicking device is provided with at least one venting aperture.
4. A dispensing unit as claimed in Claim 3, or any claim dependent thereon,  
20 wherein the wicking device is provided with at least one venting aperture positioned such that there is at least one functioning venting hole for every possible functional position of the adjustable wicking device.
5. A dispensing unit as claimed in Claim 4, further comprising a spillage tray  
25 positioned in use below the wicking device, and having formed therein a vent channel arranged in communication with the at least one functioning venting aperture.
6. A liquid dispensing unit comprising a housing containing a wicking device for  
30 conveying liquid to be dispensed from a reservoir to a dispensing position, wherein the wicking device is provided with at least one venting aperture which in use communicates between ambient air and the reservoir so as to enable air to displace liquid dispensed from the reservoir.

7. A dispensing unit for dispensing a liquid from the rim of a lavatory bowl, the unit comprising a housing containing a wicking device for conveying liquid to be dispensed from a reservoir to a position within the stream of flushing water, wherein the wicking device is provided with at least one venting aperture which in use communicates between ambient air and the reservoir so as to enable air to displace liquid dispensed from the reservoir.
8. A dispensing unit as claimed in any one of Claims 3 to 7, wherein said at least one venting aperture comprises one or more substantially circular holes.
9. A dispensing unit as claimed in any one of Claims 3 to 7, wherein said at least one venting aperture comprises one or more elongate slits.
10. A dispensing unit as claimed in Claim 7 or any claim dependent thereon, wherein the unit is so structured as to permit the position of the wicking device to be adjusted between different positions so as to function with lavatory bowls with different shapes and different flushing systems.
11. A dispensing unit as claimed in any preceding claim, further comprising a conduit for conveying liquid from the reservoir to the wicking device.
12. A dispensing unit as claimed in Claim 11, wherein the conduit comprises a cylindrical inlet portion of substantially circular cross-section for engaging the circular mouth of a bottle constituting the reservoir.
13. A dispensing unit as claimed in Claim 12, wherein the inlet portion terminates obliquely so as to define a substantially elliptical aperture.
14. A dispensing unit as claimed in Claim 12 or Claim 13, wherein the conduit further comprises a substantially cylindrical outlet portion having a cross-sectional area substantially less than that of the inlet portion.

15. A dispensing unit as claimed in Claim 14, wherein the inlet portion of the conduit is laterally displaced from the outlet portion.
- 5 16. A dispensing unit as claimed in Claim 14 or Claim 15, wherein the substantially cylindrical outlet portion has a substantially D-shaped cross-section.
17. A dispensing unit as claimed in Claim 14 or Claim 15, wherein the substantially cylindrical outlet portion has a substantially circular cross-section.
- 10 18. A dispensing unit as claimed in Claim 14 or Claim 15, wherein the substantially cylindrical outlet portion has a substantially rectangular cross-section.
- 15 19. A dispensing unit as claimed in any one of Claims 14 to 18, wherein the housing further comprises a cylindrical barrier member at least partially surrounding the outlet portion of the conduit to act as a barrier against water ingress in the reservoir.
- 20 20. A dispensing unit as claimed in Claim 19, wherein the barrier member is substantially rectangular in cross-section.
21. A dispensing unit as claimed in Claim 20, wherein one of the two long sides of the substantially rectangular cross-section of the barrier member portion coincides with a diameter of the substantially circular inlet portion of the conduit when viewed in longitudinal cross-section.
- 25 22. A dispensing unit as claimed in any one of Claims 14 to 21, and structured such that the outlet portion of the conduit bears against the wicking device so as to create a substantially liquid-tight seal therebetween.
- 30 23. A dispensing unit as claimed in any preceding claim, wherein the wicking device comprises a first portion for receiving liquid from the reservoir and a second portion arranged to be positioned in use in a dispensing position.

24. A dispensing unit as claimed in Claim 23, when dependent on Claim 2 or Claim 7, or any claim dependent thereon, wherein the second portion is arranged to be positioned in use within the stream of flushing water.
- 5 25. A dispensing unit as claimed in Claim 24, wherein the second portion is arranged to be positioned in use between the first portion and the rim of the lavatory bowl.
- 10 26. A dispensing unit as claimed in any one of Claims 22 to 25, when dependent on Claim 12, wherein the unit is structured so as to permit the position of the wicking device to be adjusted by sliding the first portion thereof against the outlet portion of the conduit.
- 15 27. A dispensing unit as claimed in any preceding claim, wherein the wicking device is substantially laminar.
- 20 28. A dispensing unit as claimed in Claim 27, wherein the laminar wicking device is formed with a depression for receiving the neck of a bottle constituting a said reservoir.
- 25 29. A dispensing unit as claimed in Claim 27 or Claim 28, wherein the wicking device is formed with one or more elongate apertures and the housing comprises a corresponding one or more projections for engaging the elongate apertures so as to define the outermost possible operative position of the wicking device.
- 30 30. A dispensing unit as claimed in Claim 29, wherein said one or more projections each comprises a spring finger which is arranged to engage its corresponding aperture in the wicking device when the wicking device is inserted into the housing.
- 30 31. A dispensing unit as claimed in Claim 27, wherein the wicking device comprises a projection for insertion in the mouth of a said reservoir in use, the projection having formed therethrough a vent channel.

32. A dispensing unit as claimed in any preceding claim, wherein the wicking device comprises a porous pad.
- 5 33. A dispensing unit as claimed in any one of Claims 1 to 30, wherein the wicking device comprises a plate with capillary channels formed therein.
34. A dispensing unit as claimed in any one of Claims 1 to 30, wherein the wicking device comprises a plate with substantially circular holes formed therein.
- 10 35. A dispensing unit as claimed in any preceding claim, in combination with means for suspending the unit from the rim of a lavatory bowl.
- 15 36. A dispensing unit as claimed in Claim 12, or any claim dependent thereon, in combination with a bottle constituting the reservoir, the bottle comprising an opening for dispensing the liquid therefrom, the opening having a substantially circular cross-section greater than that of the inlet portion of the conduit.
- 20 37. A combination of a dispensing unit and a bottle, as claimed in Claim 36, wherein the mouth of the bottle is covered prior to use with a frangible seal which is arranged to be broken in use by compressing the seal against the circular inlet portion of the conduit.
- 25 38. A combination of a dispensing unit and a bottle, as claimed in Claim 36 or Claim 32, in combination with means for suspending the unit and the bottle from the rim of a lavatory bowl.
- 30 39. A liquid dispensing unit comprising a wicking device for conveying liquid to be dispensed from a reservoir to a dispensing position, in combination with a reservoir bottle, wherein the reservoir bottle is provided with venting means for permitting ambient air to enter the bottle to displace liquid dispensed therefrom.

40. A dispensing unit for dispensing a liquid from the rim of a lavatory bowl, in combination with a reservoir bottle, the unit comprising a wicking device for conveying liquid to be dispensed from the reservoir bottle to a position within the stream of flushing water, wherein the reservoir bottle is provided with venting means for permitting ambient air to enter the bottle to displace liquid dispensed therefrom.
41. A combination of a dispensing unit and reservoir bottle, as claimed in Claim 38 or Claim 36, wherein said venting means comprises a one-way valve.
42. A combination as claimed in Claim 41, wherein said one-way valve comprises a duck-bill valve.
43. A combination of dispensing unit and bottle, as claimed in Claim 39 or Claim 36, wherein said venting means comprises a removable plug and said unit comprises a co-operating projection which is positioned so as to remove the plug when the reservoir bottle is placed by a user in its operative position in relation to the unit, thereby to create a venting aperture in the reservoir bottle.
44. A combination of dispensing unit and bottle, as claimed in Claim 39 or Claim 36, wherein said venting means comprises a removable seal and said unit comprises a co-operating hollow projection which is positioned so as to remove the seal and project into the reservoir bottle when the reservoir bottle is placed by a user in its operative position in relation to the unit, the hollow projection constituting a venting channel.
45. A combination of dispensing unit and bottle, as claimed in Claim 39 or Claim 36, wherein said venting means comprises an air vent in the reservoir bottle which is sealed by a cover portion which can be removed by a user prior to use.
46. A combination of dispensing unit and bottle, as claimed in Claim 39 or Claim 36, wherein said venting means comprises an air vent in the reservoir bottle which is sealed by a cover portion, and wherein the unit comprises a projection



arranged so as to remove the cover portion when the reservoir bottle is placed by a user in its operative position in relation to the unit.

47. A method of filling and sealing a dispenser bottle for use as a reservoir within a dispensing unit as claimed in any one of Claims 1 to 33, the method comprising heating the liquid prior to sealing the reservoir bottle so as to create a partial vacuum within the bottle when the liquid cools to room temperature.
48. A method of filling and sealing a flexible dispenser bottle for use as a reservoir within a dispensing unit as claimed in any one of Claims 1 to 33, the method comprising causing the bottle to be compressed after filling the bottle with the liquid and sealing the bottle while compressed so as to create a partial vacuum within the bottle after sealing.

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FIG. 1

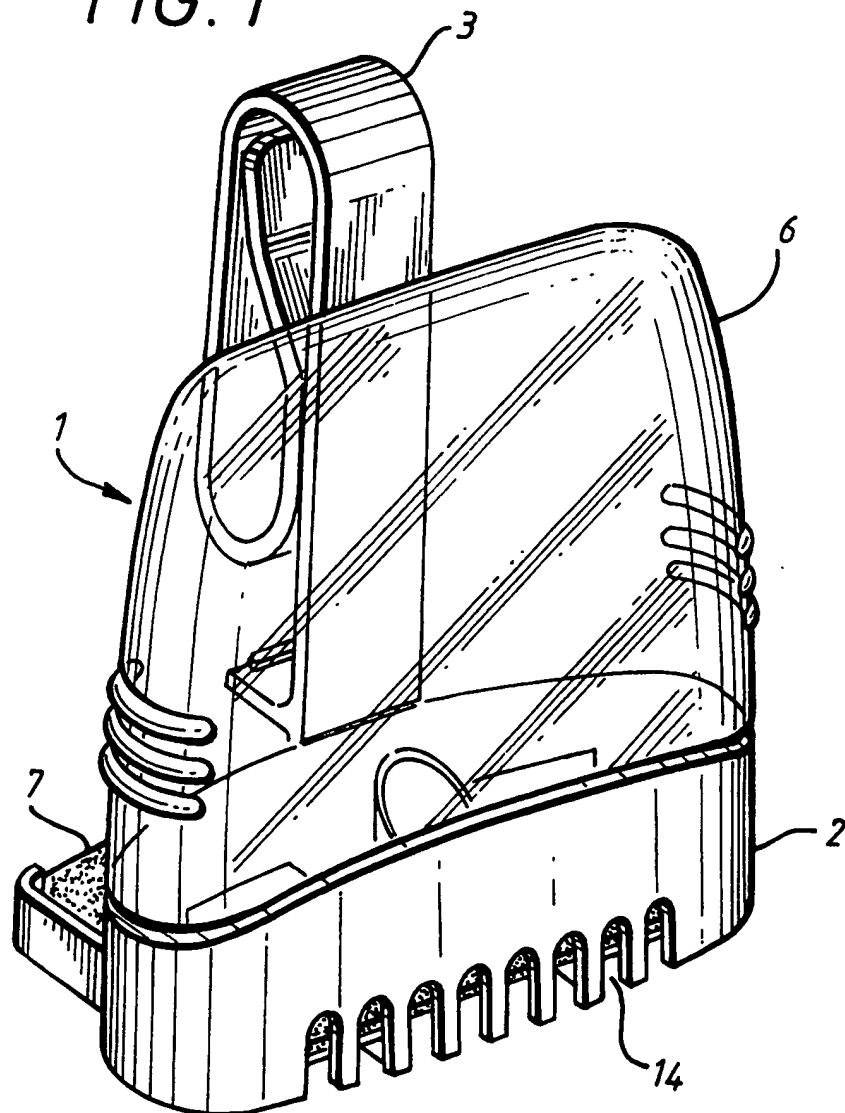
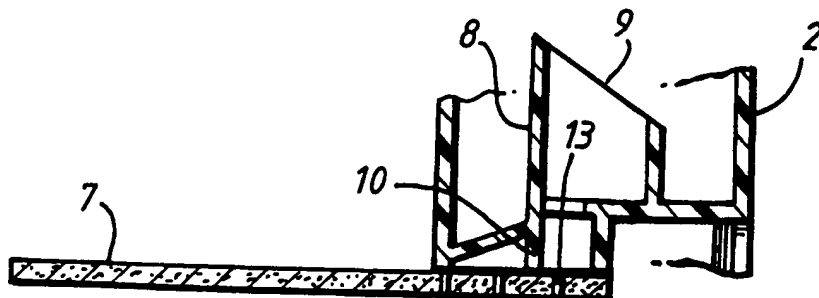
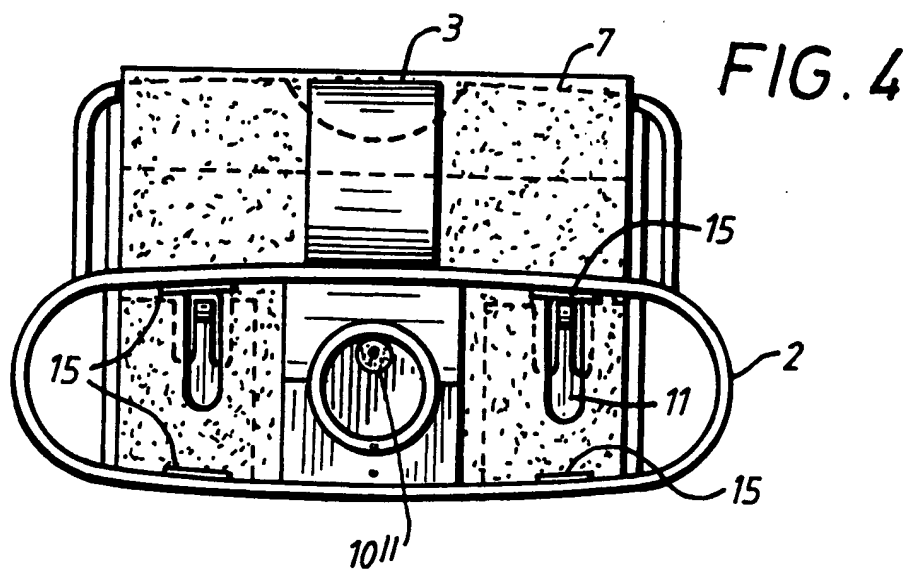
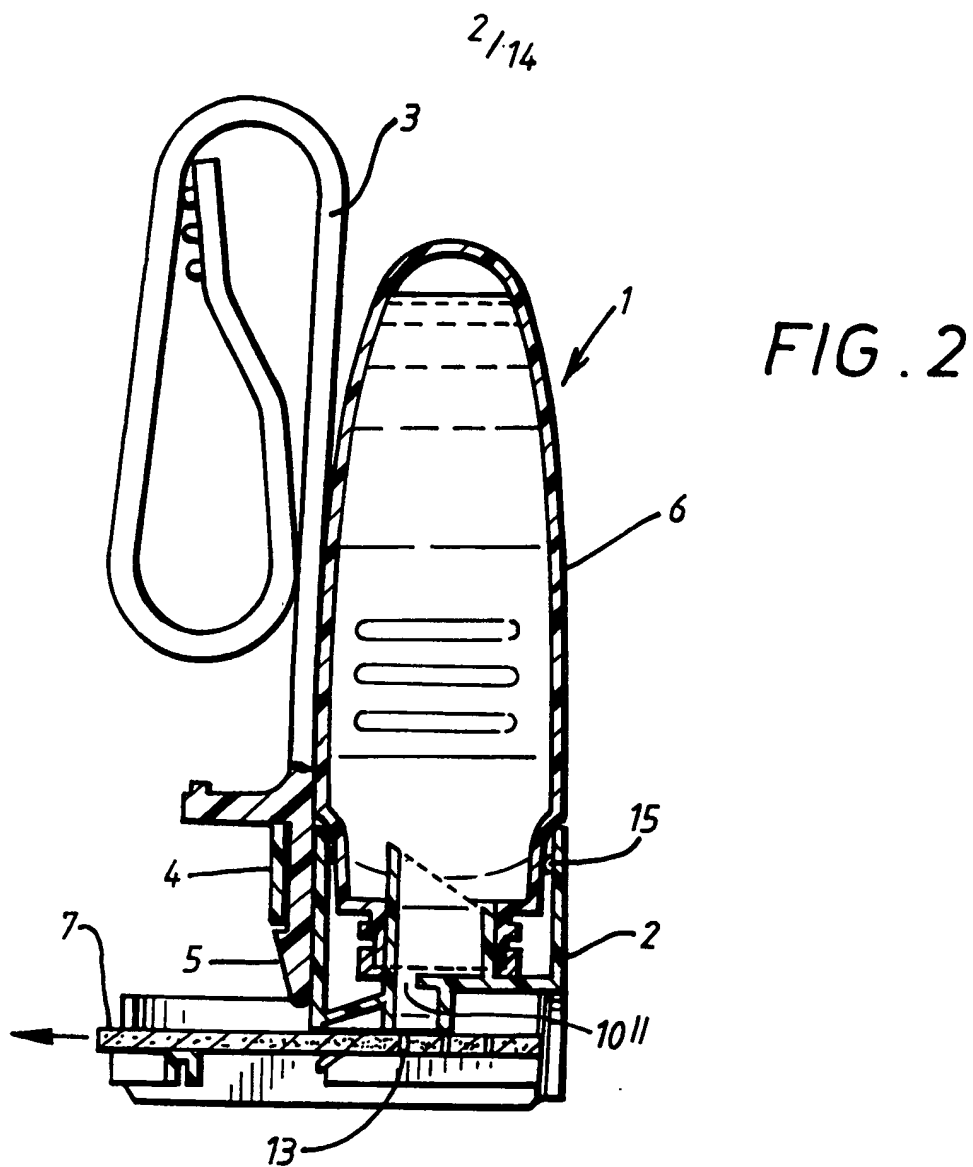


FIG. 3





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FIG. 4(a)

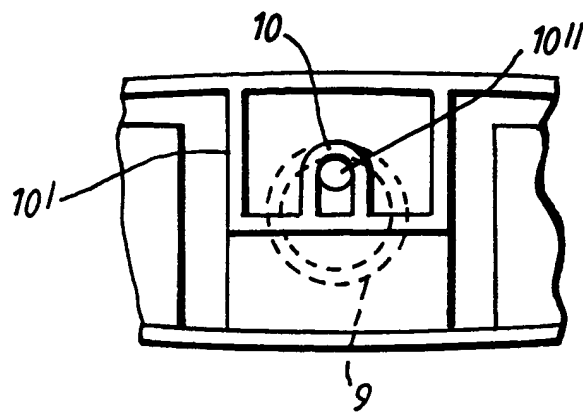


FIG. 4(b)

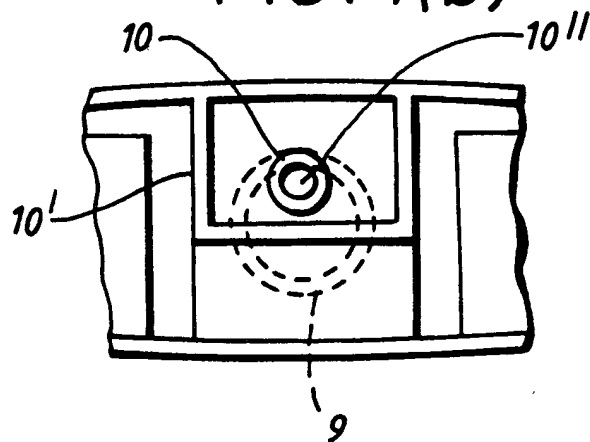


FIG. 4(c)

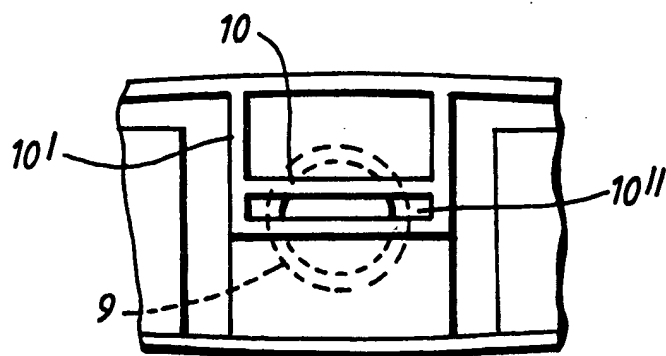


FIG. 6

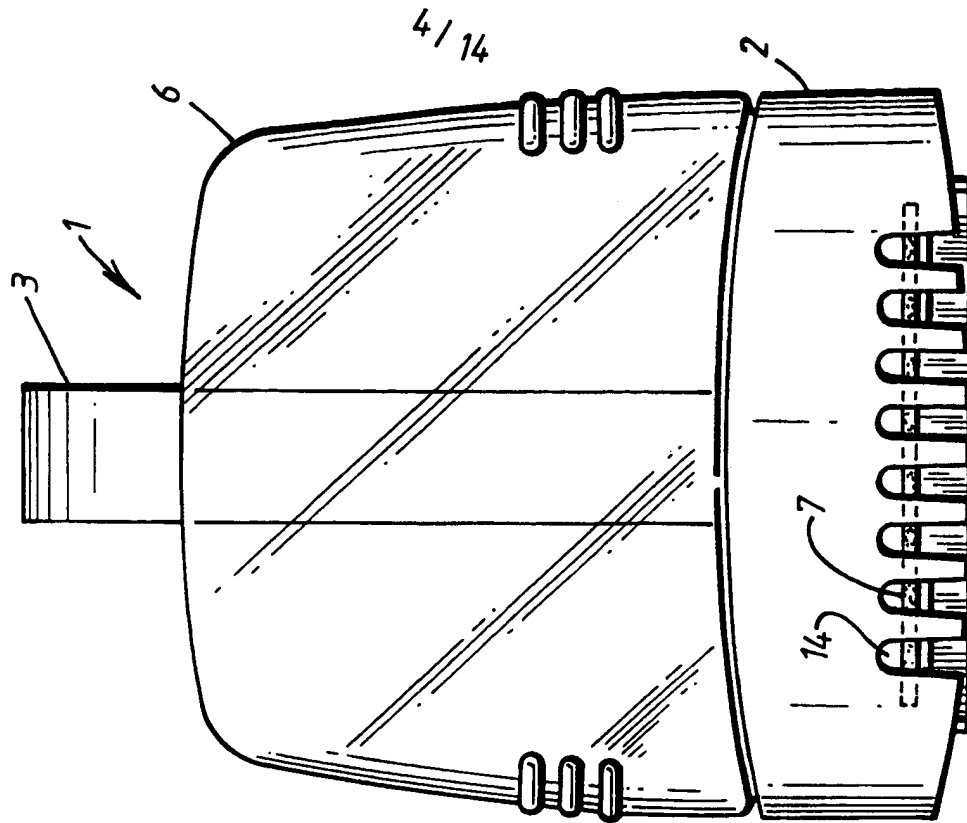
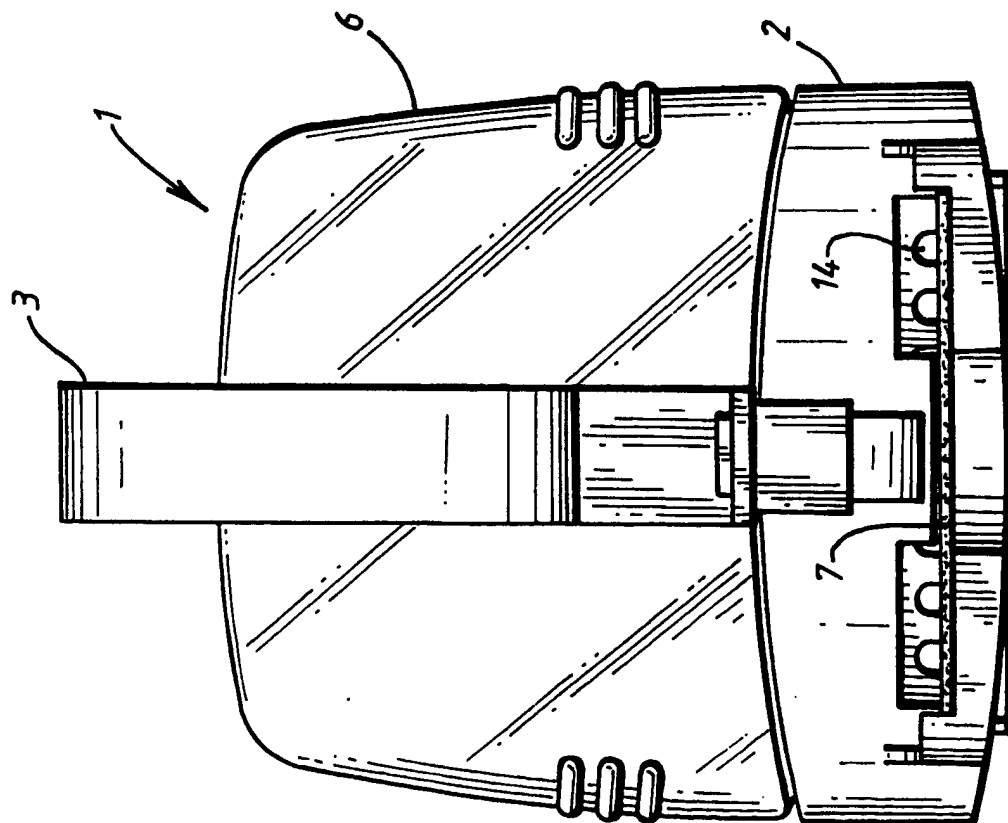


FIG. 5



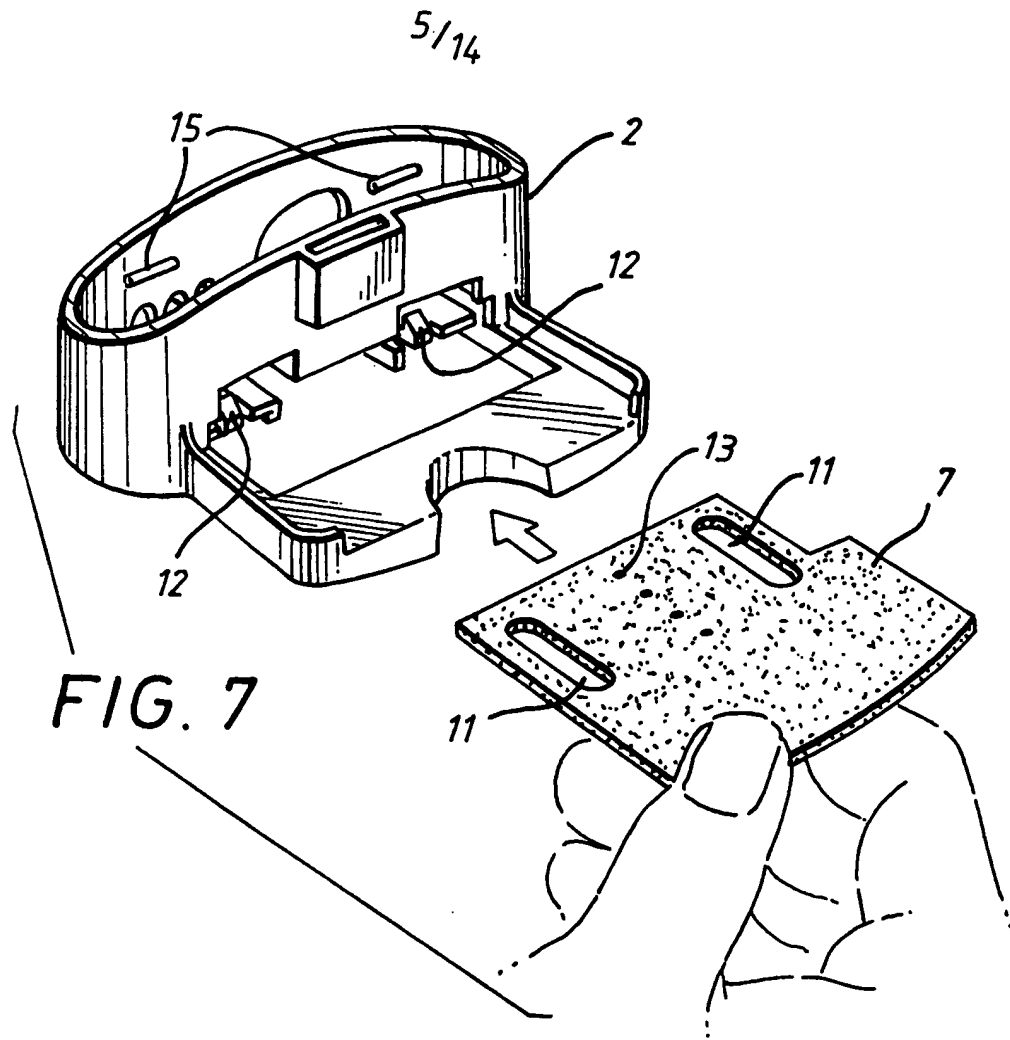
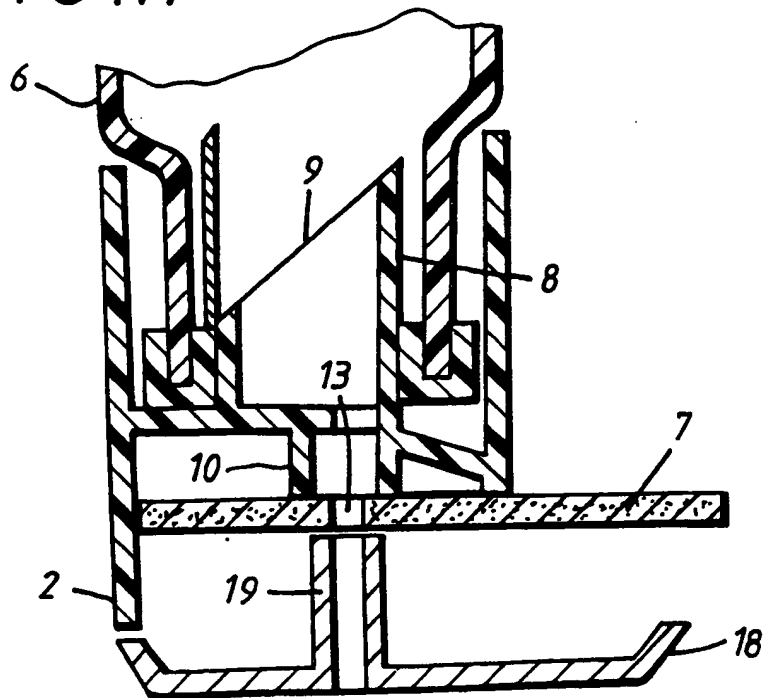


FIG. 11



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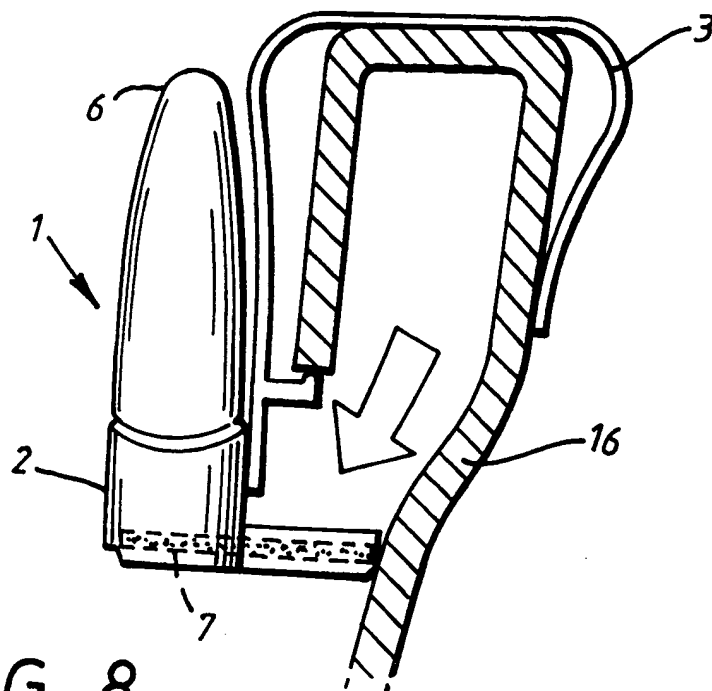


FIG. 8

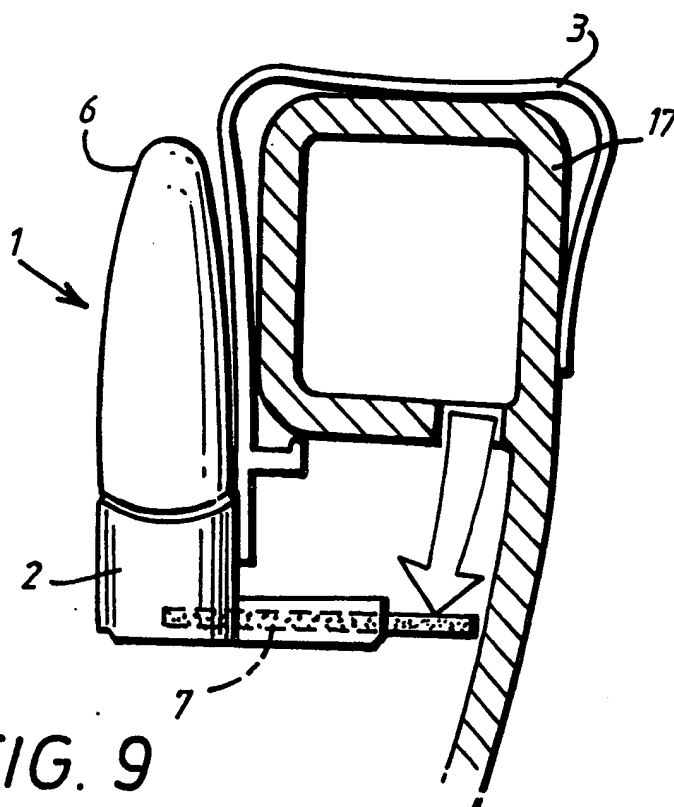
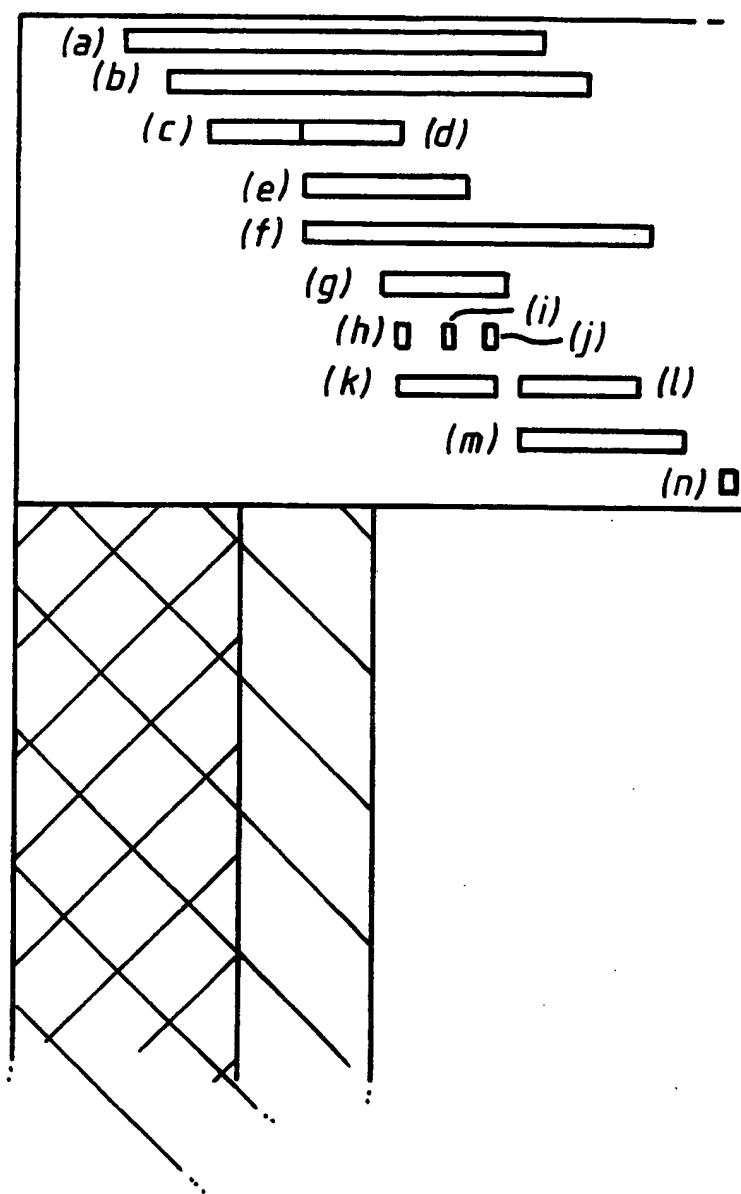


FIG. 9

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FIG. 10





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FIG. 12(a)

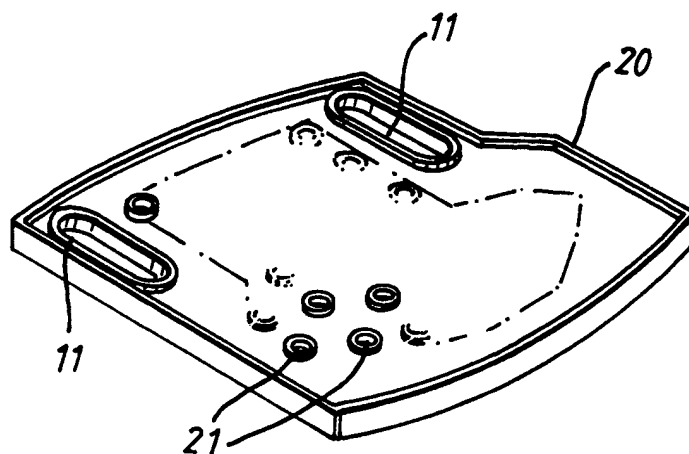


FIG. 12(b)

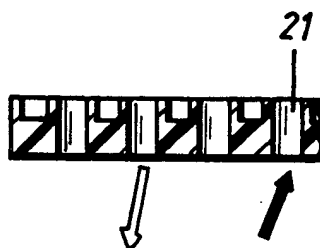


FIG. 13(a)

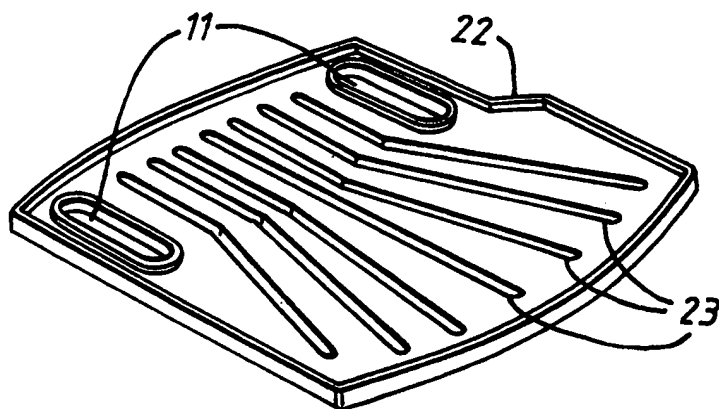
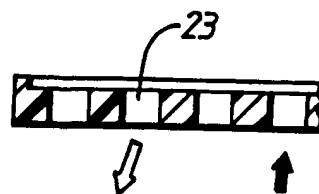
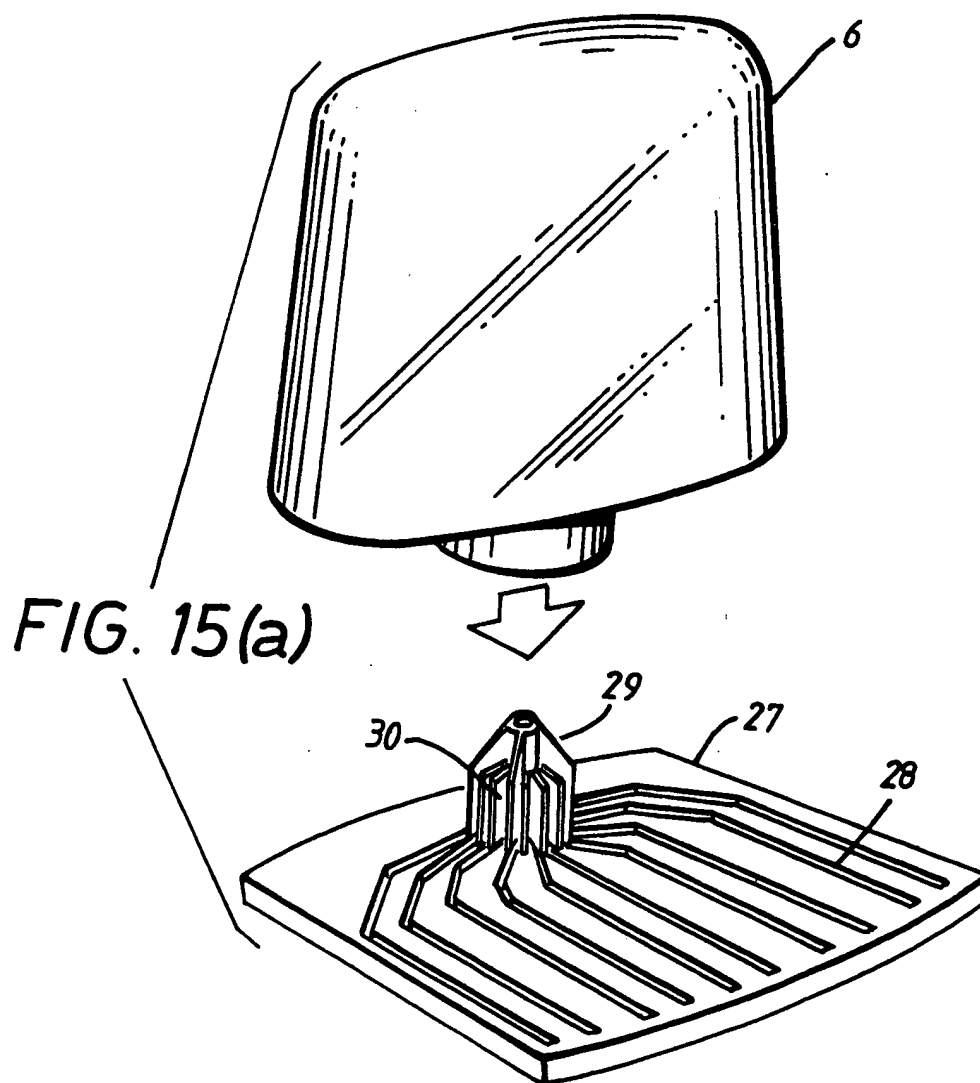
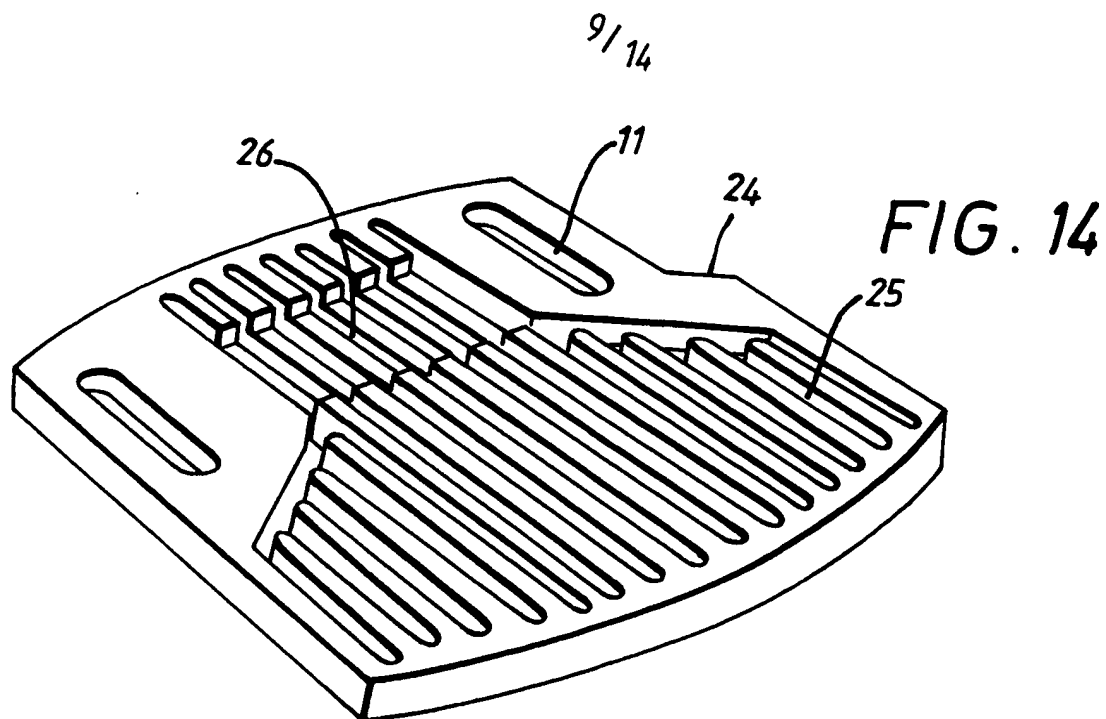


FIG. 13(b)





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FIG. 15(b)

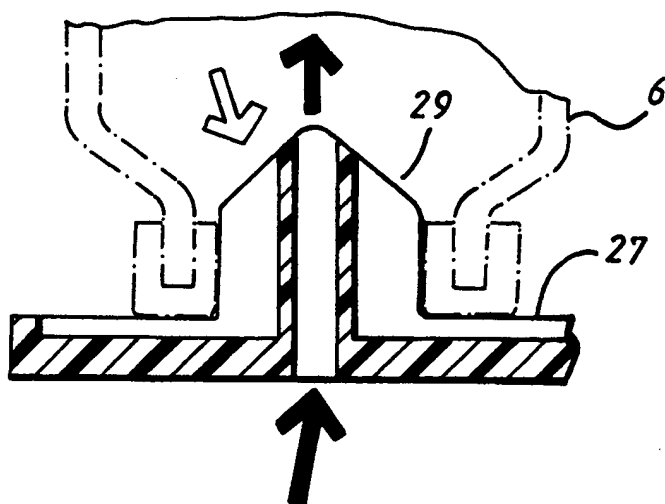


FIG. 16(a)

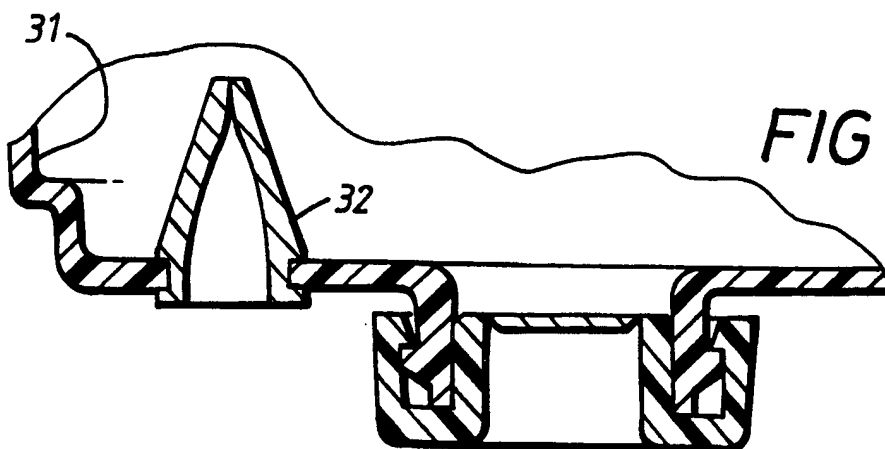
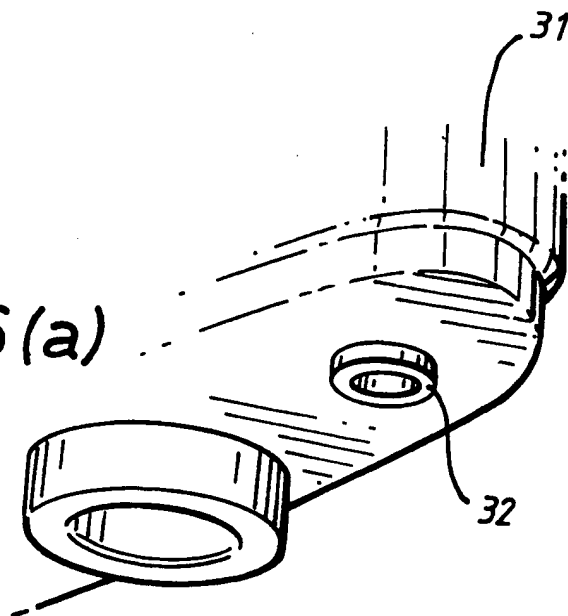


FIG. 16(b)

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FIG. 17(a)

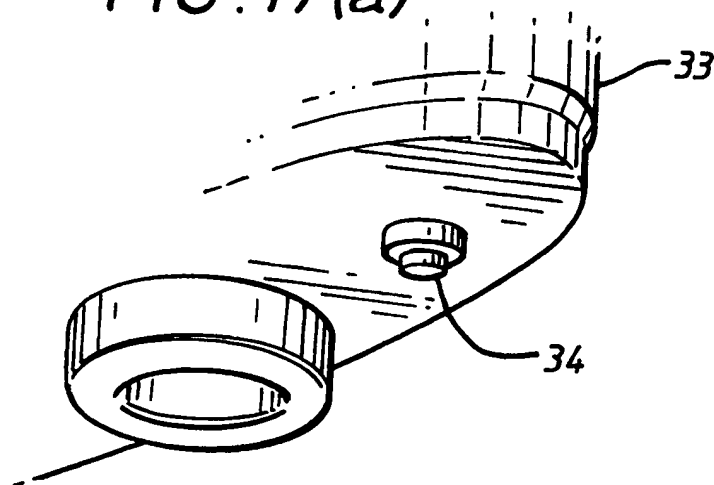


FIG. 17(b)

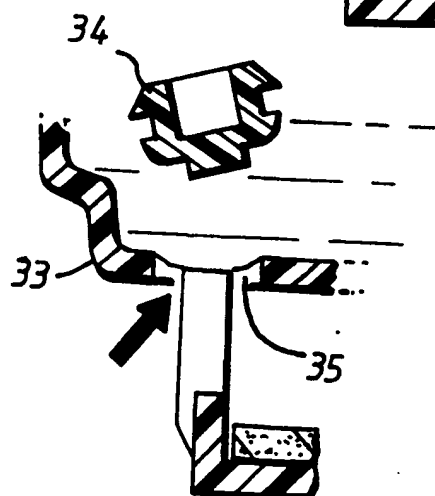
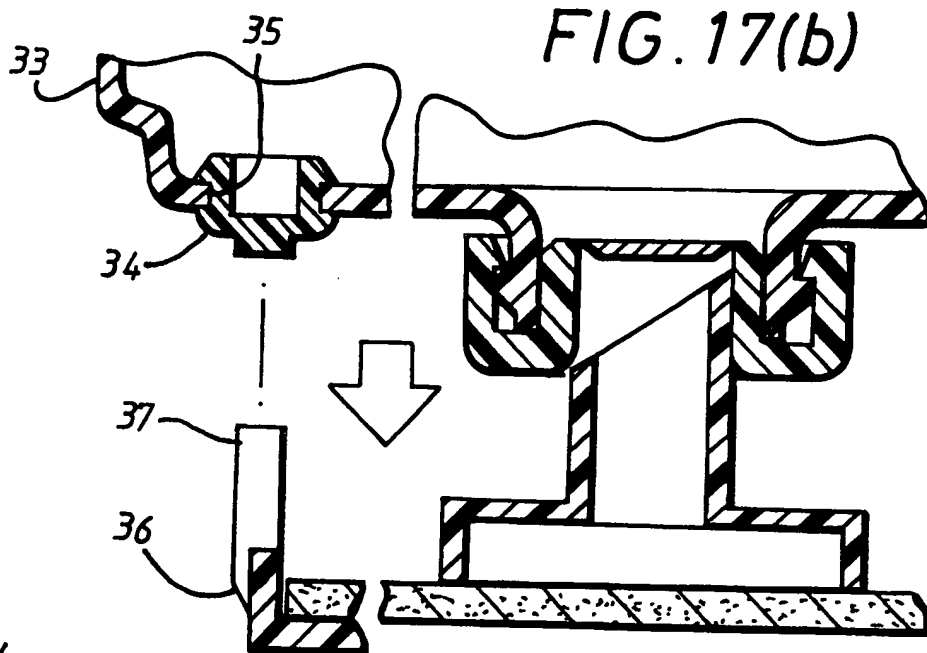


FIG. 17(c)

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FIG. 18(a)

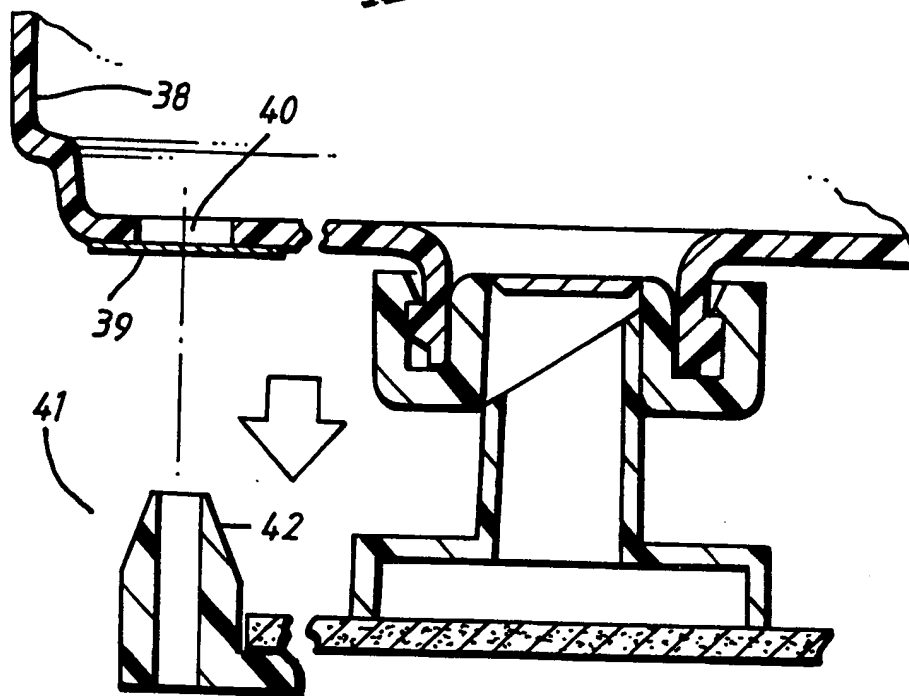
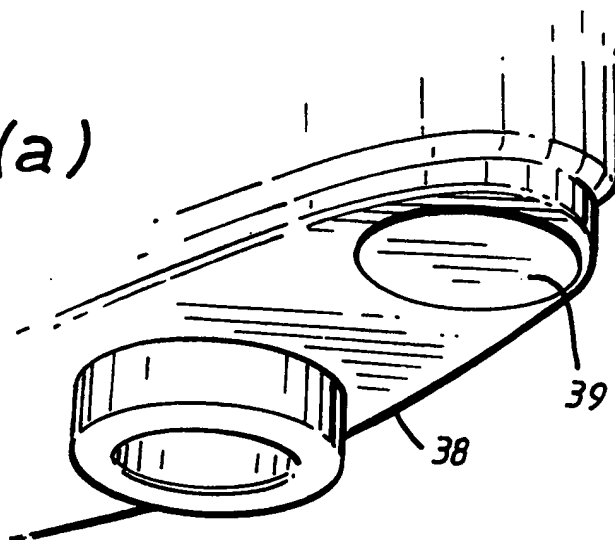


FIG. 18(b)

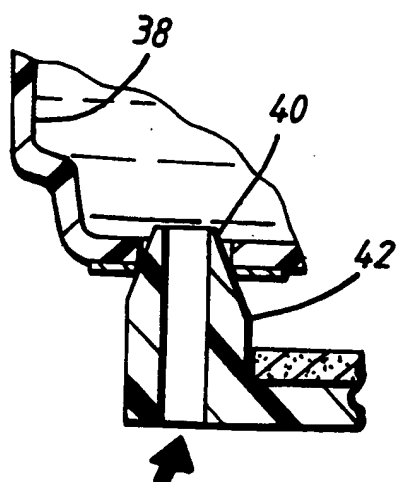
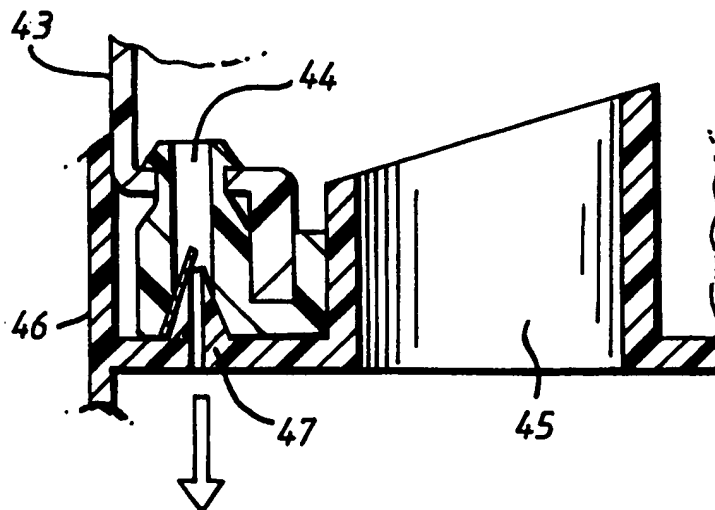
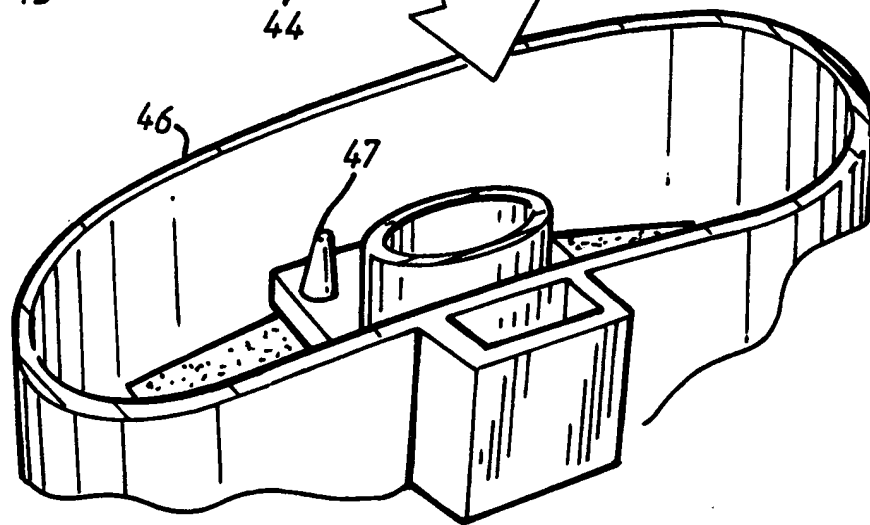
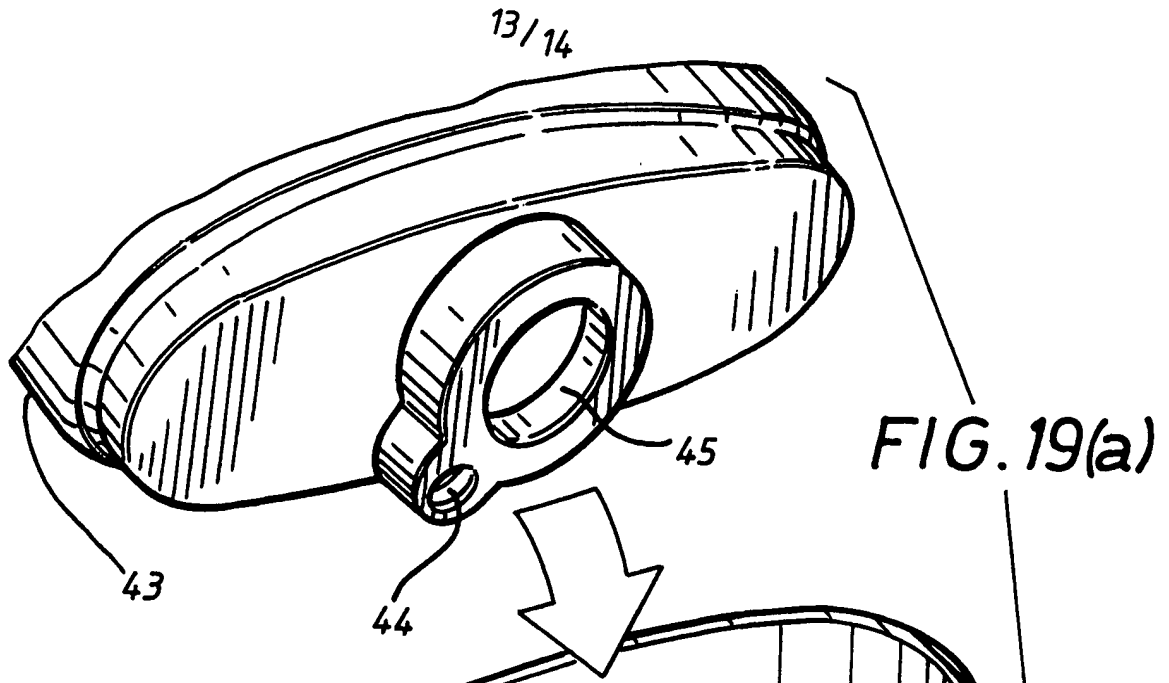


FIG. 18(c)



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FIG. 20(a)

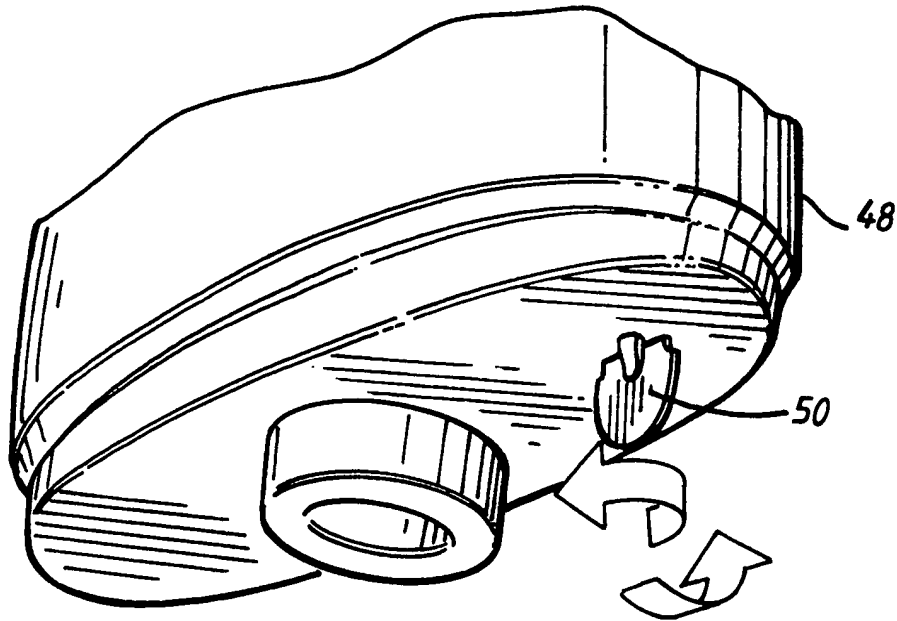
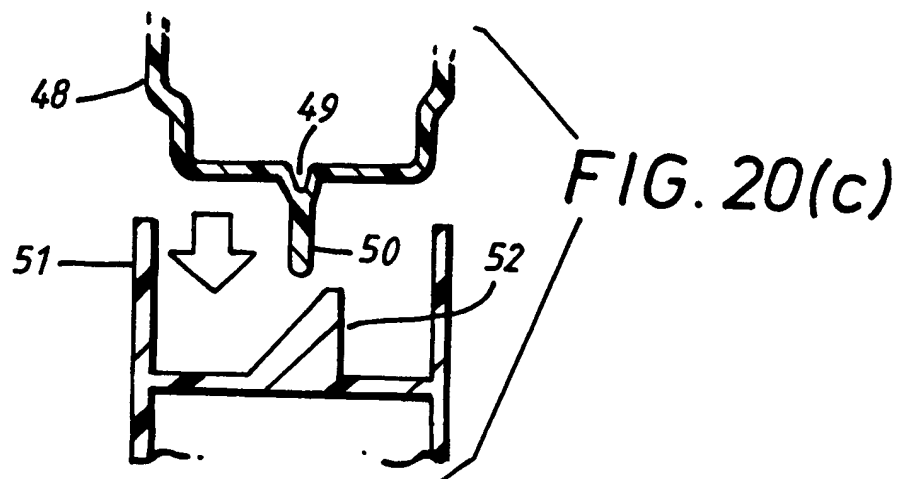
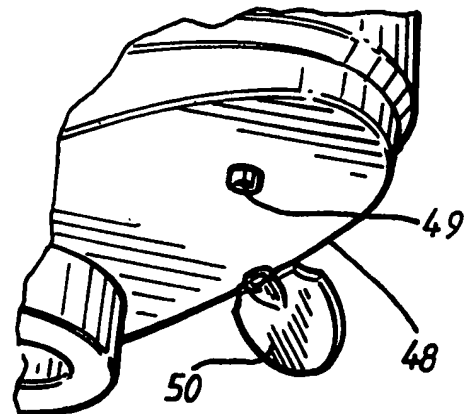


FIG. 20(b)



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 98/01364

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 E03D9/03 B67C3/14 B67C7/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 E03D B67C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 349 988 A (KOTULA FRANK T ET AL) 21 September 1982 see column 4, line 15 - column 5, line 15; figures 1,2	1
A	EP 0 785 315 A (LEE DE NV SARA) 23 July 1997 cited in the application  see column 2, line 24 - column 4, line 13; figures	1,2,6,7, 11,12, 23-25, 32,35, 36, 38-40, 43-46

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

4 June 1999

Date of mailing of the international search report

10.06.99

Name and mailing address of the ISA

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Authorized officer

De Coene, P



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 98/01364

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 538 957 A (LEE DE NV SARA) 28 April 1993  see column 2, line 30 - column 4, line 1; figures ---	1,2,5-7, 12, 23-25, 32, 34-36, 38-40
A	CA 1 130 763 A (ALIKHAN RAZA) 31 August 1982 see page 5, paragraph 3 ---	47,48
A	DE 25 23 849 A (CARNAUD TOTAL INTERPLASTIC) 18 December 1975 see the whole document -----	47

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IB 98/01364

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

International Application No. PCT/IB 98/01364

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-46

1-5: A liquid dispensing device in which the position of the wicking device can be adjusted.

6-46: A liquid dispensing device in which the wicking device is provided with a venting aperture.

2. Claims: 47, 48

A method of filling and sealing a dispenser bottle.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB 98/01364

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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